

μQ7-T30

μQseven® Module with NVIDIA™ T30 Processor



User Manual



μQ7-T30

REVISION HISTORY

Revision	Date	Note	Rif.
1.0	26 th February 2013	First release	SB

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Moreover in order to have the proper assistance for any possible issue please contact us using dedicated web form available at <http://www.seco.com/en/contatti.html> (registration required).

Our team will be pleased and ready to assist you.

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Chapter 1. INTRODUCTION

- **Warranty**
- **Information and assistance**
- **RMA number request**
- **Safety**
- **Electrostatic Discharges**
- **RoHS compliance**



1.1 Warranty

This product is subject to Italian law D. Lgs 24/2002, acting European Directive 1999/44/CE on arguments of sale and warranties to consumer.

The warranty for this product lasts 1 year

Under the warranty period the Supplier guarantees the buyer an assistance service for repairing, replacing or credit of the item, at its own discretion.

Shipping costs regarding non-conforming items or items that need replacement have to be paid by the customer.

Items cannot be returned unless formerly authorised by the supplier.

The authorisation is released after compiling the specific form available from the web-site <http://www.seco.com> (RMA Online). Authorisation number for returning the item must be put both on the packaging and on the documents brought with the items, which have to be not damaged, not tampered, with all accessories in their original packaging.

Error analysis form identifying the fault type has to be compiled by the customer and has to be sent in the packaging of the returned item.

If some of the above mentioned requirements for returning the item are not satisfied, item will be shipped back and customer will have to pay for shipping costs.

The supplier, after a technical analysis, will verify if all the requirements for warranty service are met. If warranty cannot be applied, he calculates the minimum cost of this initial analysis on the item and the repairing costs. Costs for replaced components will be calculated aside.

Warning!



All changes or modifications to the equipment not clearly approved by SECO S.r.l. could impair equipment's functionality and lead to the expire of the warranty

1.2 Information and assistance

What do I have to do if the product is faulty?

SECO S.r.l. offers the following services:

- SECO website: visit <http://www.secoqseven.com> to receive the last information on the product. In most of the cases you can find useful information to resolve your problem.
- SECO reseller: the reseller or agent can help you in determining the exact cause of the problem and search the best solution for it.
- SECO Help-Desk: contact SECO Technical Assistance.

A technician is at your disposal to understand the exact origin of the problem and suggest the right solution.

E-mail: technical.service@seco.com

Fax (+39) 0575 340434

- Repairing centre: it is possible to send the faulty product to SECO Repairing Centre. In this case, follow this procedure:
 - Returned items have to be provided with RMA Number. Items sent without RMA number will be not accepted.
 - Returned items have to be packed in the appropriate manner. SECO is not responsible for damages caused by accidental drop, improper usage, or customer neglects.

Note: We ask to prepare the following information before asking for technical assistance:

- Name and serial number of the product;
- Description of Customer's peripheral connections;
- Description of Customer's software (operative system, version, application software, etc.);
- A complete description of the problem;
- The exact words of every kind of error message received

1.3 RMA number request

To request a RMA number, please, visit SECO's web-site. In the home-page select "RMA Online" and follow the described procedure

You will receive an RMA Number within 1 working day (only for on-line RMA request).

1.4 Safety

μQ7-T30 module only uses extremely-low voltages.

While handling the board, it is necessary to be careful in order to avoid any kind of risk or damages to electronic components. Always switch the power off, and unplug the power supply unit, before handling the board and/or connecting cables or other boards.

Don't use metallic components, like paper clips, screws and similar, near the board, when this is supplied, to avoid short circuits due to unwanted contacts with other components of the board.

Never connect the board to an external power supply unit or battery, if the board has become wet.

Make sure that all cables are correctly connected and are not damaged.

1.5 Electrostatic Discharges

μQ7-T30, like any other electronic product, is an electrostatic sensitive device and some device on-board could be damaged by high voltages caused by static electricity.

So whenever handling a μQ7-T30board, take care to ground yourself through an anti-static wrist strap. Placement of the board on an anti-static surface is also highly recommended.

1.6 RoHS compliance

μQ7-T30 board is designed using RoHS compliant components and is manufactured on a lead-free production line. It is therefore fully RoHS compliant.

Chapter 2. OVERVIEW

- Introduction
- Technical Specifications
- Electrical specifications
- Mechanical specifications
- Block diagram



2.1 Introduction

μQ7-T30 is a CPU module, in μQseven[®] format, based on embedded NVIDIA[®] T30 (Tegra[®] 3) processor, a Quad Core ARM[®] Cortex[®]-A9 microprocessor that offer top performances for graphical and computational applications based on low power ARM architectures.

The board offers a very high level of integration, both for all most common used peripherals in ARM world and for bus interfaces normally used in x86 world, like PCI-Express and S-ATA.

All this comes out in the extremely reduced space offered by μQseven[®] boards, which offers all functionalities of standard boards in just 40 x 70mm.

This solution allows combining the advantages of a standard, ready-to-use board, like μQseven[®] boards are, with all advantages offered by ARM application specific processors like NVIDIA[®] Tegra[®] 3, with an integrated Quad Core ARM Cortex-A9, with frequency of 1.4 GHz per core.

Each core offers 64KB L1 Cache (32KB data, 32KB instructions), and 1MB of L2 cache.

Moreover, Tegra[®] T30 integrates a very powerful Graphical Processing Unit NVIDIA[®] GeForce ULP, with 12 independent cores, that give the processor incredible graphical performances, both 2D and 3D.

The board is completed with up to 1GB DDR3L directly soldered on board, and one eMMC Flash Disk, directly accessible like any standard Hard Disk, with up to 16GB of capacity.

The board has three display interfaces, up to two can work simultaneously in an independent way: the first one, is a 24 bit Single/Dual Channel LVDS interface, and is obtained by converting internally the first integrated display interface of T30 processor. Second display interface, is Tegra[®] T30's native HDMI interface. The third display interface is Tegra[®] T30's DSI interface.

HW video decoding of the most common coding standard (i.e., H.264, MPEG2, MPEG4, DivX, RealVideo and other) is supported.

Interface to the board comes through the single card edge connector, as defined by Qseven[®] specifications Rel. 2.0: on this connector, signals are available for Gigabit Ethernet, 2 x SD/SDIO/MMC interfaces, 3 x USB 2.0 ports, 24-bit Single/Dual Channel LVDS, HDMI interface, DSI Interface, 4 x PCI-Express x 1 lanes (can be grouped in 1x PCI-Express x4 lane), HD Audio interface, I²C, SPI and SM buses, and other features, like 2 x UART and One-Wire.

For external interfacing to standard devices, a carrier board with a 230-pin MXM connector is needed. This board will implement all the routing of the interface signals to external standard connectors, as well as integration of other peripherals/devices not already included in μQ7-T30CPU module.

To learn more about Qseven[®] standard: <http://www.qseven-standard.org>.

To learn more about SECOQseven philosophy: <http://www.secoqseven.com>.

2.2 Technical Specifications

- **Processors:** NVIDIA® Tegra® T30 with Quad ARM® CORTEX-A9 MPCore® CPU, 1,3GHz per Core
- **Memory:** Up to 1GB DDR3L onboard
- **Graphics:** embedded NVIDIA® ULP GeForce® GPU
Integrated High Definition Audio-Video Processor
- **Display:** LVDS Single / Dual Channel 18/24 bit interface (resolution up to 1920x1080)
HDMI interface (resolution up to 1920x1080p)
DSI Interface (resolution up to 1440x900 @18bpp, 1366x800@24bpp)
- **Mass Storage:** On board eMMC, up to 16GB
1 x S-ATA channels
2 x MMC/SD/SDIO interfaces
- **PCI Express:** 1 x PCI-e x4 lane or 2 x PCI-e x2 lanes (with support for 2x PCI-e x1 devices)
- **USB:** 3 x USB 2.0 Host
- **Networking:** Gigabit Ethernet interface
- **Audio:** HD Audio interface
- **Serial Ports:** 2x serial ports
- **Other interfaces:** I²C, SM Bus, SPI
- **Power Management signals**
- **Power supply voltage:** +5V_{DC} ± 5%
- **Operating temperature:** 0°C ÷ +60°C
- **Dimensions:** 40 x 70 mm (1.57" x 2.76")

2.3 Electrical specifications

According to Qseven[®] specifications, μ Q7-T30 board needs to be supplied only with an external +5V_{DC} power supply.

+5V_{SB} voltage needs to be supplied for working in ATX mode. For Real Time Clock working and CMOS memory data retention, it is also needed a backup battery voltage. All these voltages are supplied directly through card edge fingers (see connector's pinout).

All remaining voltages, needed for board's working, are generated internally from +5V_{DC} power rail.

2.3.1 Power Consumption

TBM

2.4 Supported Operating Systems

μ Q7-T30 supports the following operating systems:

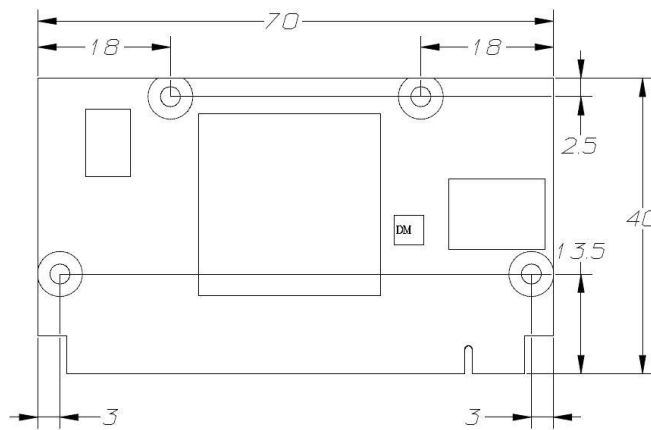
- Linux
- Android
- Windows EC 7

SECO will offer the BSP (Board Support Package) for these O.S., to reduce at minimum SW development of the board, giving all the drivers and libraries needed for use both the Qseven[®] board and the Carrier Board, according that the Carrier Board is designed following SECOQseven Design Guide, with the same IC's.

For further details, please visit <http://www.secoqseven.com>.

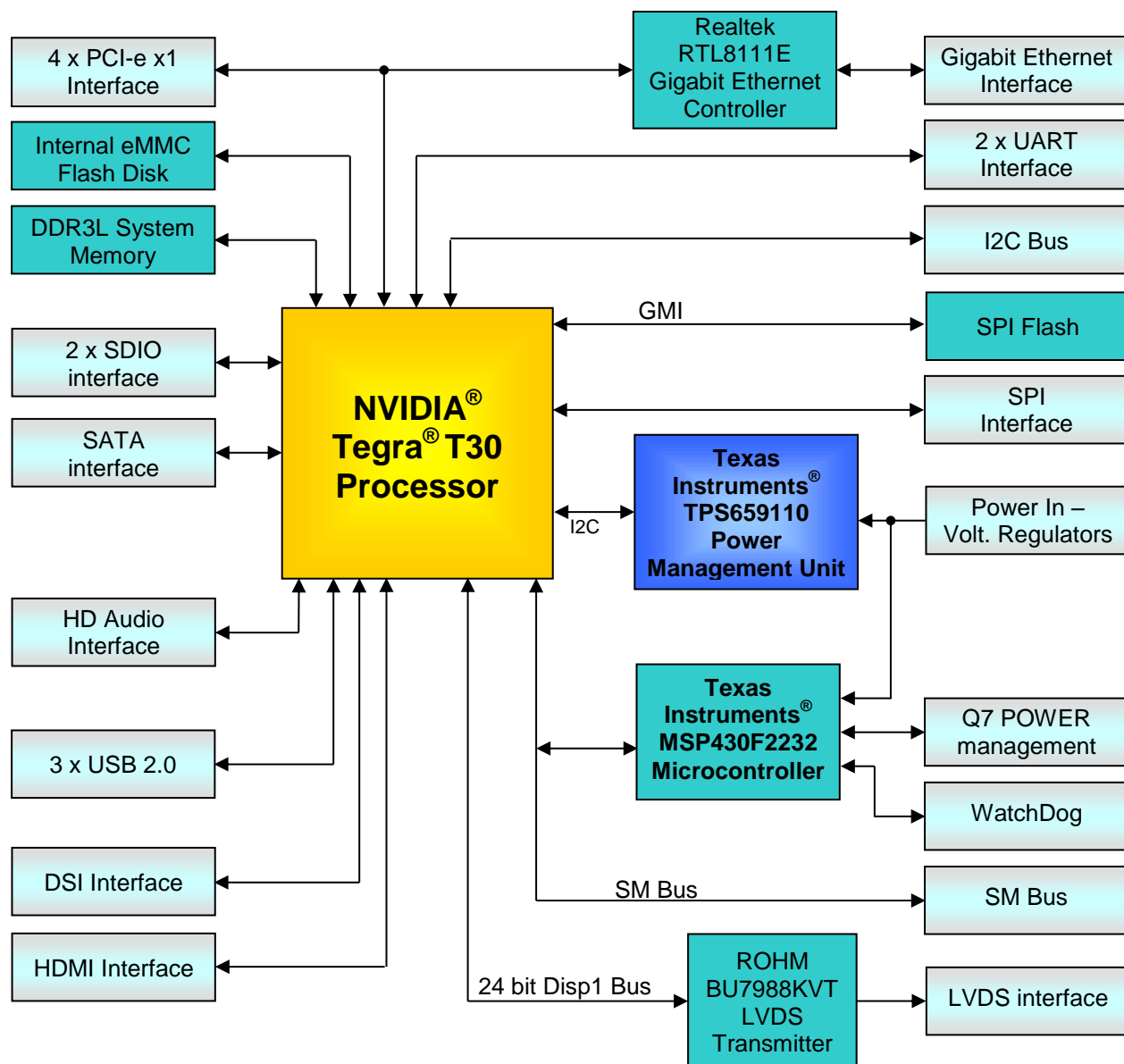
2.5 Mechanical specifications

According to Qseven[®] specifications, board dimensions of μ Qseven form factor boards are: 40 x 70 mm (1.57" x 2.76").



Printed circuit of the board is made of twelve layers; some of them are ground planes, for noise rejection.

2.6 Block diagram



Chapter 3. CONNECTORS

- Connectors overview
- Connectors description



3.1 Connectors overview

According to Qseven® specifications, all interfaces to the board are available through a single card edge connector.

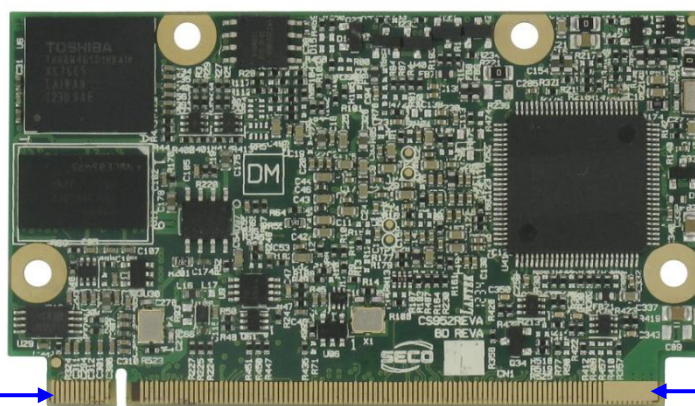
Top side



Card edge golden finger, pin 228

Card edge golden finger, pin 2

Bottom side



Card edge golden finger, pin 1

Card edge golden finger, pin 229

3.2 Connectors description

3.2.1 Qseven® Connector

According to Qseven® specifications, all interface signals are reported on the card edge connector, which is a 230-pin Card Edge that can be inserted into standard MXM connectors, as described in Qseven® specifications

Not all signals contemplated in Qseven® standard are implemented on MXM connector, due to the functionalities really implemented on μQ7-T30 CPU module. Therefore, please refer to the following table for a list of effective signals reported on MXM connector.

For accurate signals description, please consult Qseven® specifications.

NOTE: Even pins are available on top side of CPU board; odd pins are available on bottom side of CPU board. Please refer to board photos.

Card Edge Golden Fingers – CN4			
Pin	Signal	Pin	Signal
1	GND	2	GND
3	GBE_MDI3-	4	GBE_MDI2-
5	GBE_MDI3+	6	GBE_MDI2+
7	GBE_LINK100#	8	GBE_LINK100#
9	GBE_MDI1-	10	GBE_MDI0-
11	GBE_MDI1+	12	GBE_MDI0+
13	GBE_ACT#	14	GBE_ACT#
15	GBE_CTREF	16	SUS_S5#
17	WAKE#	18	SUS_S3#
19	SUS_STAT#	20	PWRBTN#
21	SLP_BTN#	22	LID_BTN#
23	GND	24	GND
25	GND	26	PWGIN
27	BATLOW#	28	RST_BTN#
29	SATA0_TX+	30	---
31	SATA0_TX-	32	---
33	---	34	GND
35	SATA0_RX+	36	---
37	SATA0_RX-	38	---
39	GND	40	GND
41	BOOT_ALT#	42	SDIO_CLK#
43	SDIO_CD#	44	---
45	SDIO_CMD	46	SDIO_WP#
47	SDIO_PWR#	48	SDIO_DAT1
49	SDIO_DAT0	50	SDIO_DAT3
51	SDIO_DAT2	52	---
53	---	54	---
55	---	56	---

57	GND	58	GND
59	HDA_SYNC	60	SMB_CLK
61	HDA_RST#	62	SMB_DAT
63	HDA_BCLK	64	SMB_ALERT#
65	HDA_SDI	66	GP0_I2C_CLK
67	HDA_SDO	68	GP0_I2C_DAT
69	THRM#	70	WDTRIG#
71	THRMTRIP#	72	WDOUT
73	GND	74	GND
75	---	76	---
77	---	78	---
79	---	80	---
81	---	82	---
83	---	84	---
85	USB_2_3_OC#	86	USB_0_1_OC#
87	---	88	USB_P2-
89	---	90	USB_P2+
91	USB_CC	92	USB_ID
93	USB_P1-	94	USB_P0-
95	USB_P1+	96	USB_P0+
97	GND	98	GND
99	LVDS_A0+	100	LVDS_B0+
101	LVDS_A0-	102	LVDS_B0-
103	LVDS_A1+	104	LVDS_B1+
105	LVDS_A1-	106	LVDS_B1-
107	LVDS_A2+	108	LVDS_B2+
109	LVDS_A2-	110	LVDS_B2-
111	LVDS_PPEN	112	LVDS_BLEN
113	LVDS_A3+	114	LVDS_B3+
115	LVDS_A3-	116	LVDS_B3-
117	GND	118	GND
119	LVDS_A_CLK+	120	LVDS_B_CLK+
121	LVDS_A_CLK-	122	LVDS_B_CLK-
123	LVDS_BLT_CTRL	124	---
125	---	126	---
127	---	128	---
129	---	130	---
131	HDMI_CLK+	132	DSI_CLK0_D+
133	HDMI_CLK-	134	DSI_CLK0_D-
135	GND	136	GND
137	HDMI_TX1+	138	DSI_D0_D+

139	HDMI_TX1-	140	DSI_D0_D-
141	GND	142	GND
143	HDMI_TX0+	144	DSI_D1_D+
145	HDMI_TX0-	146	DSI_D1_D-
147	GND	148	GND
149	HDMI_TX2+	150	HDMI_CTRL_DAT
151	HDMI_TX2-	152	HDMI_CTRL_CLK
153	HDMI_HPD#	154	---
155	PCIE_CLK_REF+	156	PCIE_WAKE#
157	PCIE_CLK_REF-	158	PCIE_RST#
159	GND	160	GND
161	PCIE3_TX+	162	PCIE3_RX+
163	PCIE3_TX-	164	PCIE3_RX-
165	GND	166	GND
167	PCIE2_TX+	168	PCIE2_RX+
169	PCIE2_TX-	170	PCIE2_RX-
171	UART1_TX	172	UART1_RTS#
173	PCIE1_TX+	174	PCIE1_RX+
175	PCIE1_TX-	176	PCIE1_RX-
177	UART1_RX	178	UART1_CTS#
179	PCIE0_TX+	180	PCIE0_RX+
181	PCIE0_TX-	182	PCIE0_RX-
183	GND	184	GND
185	SD2_DAT0	186	SD2_DAT1
187	SD2_DAT2	188	SD2_DAT3
189	SD2_CLK	190	SD2_CMD
191	SD2_PWR	192	SD2_CD#
193	Vcc_RTC	194	GP_PWM_OUT2
195	FAN_TACHOIN	196	FAN_PWMOUT
197	GND	198	GND
199	SPI_MOSI	200	SPI_CS0#
201	SPI_MISO	202	SPI_CS1#
203	SPI_CLK	204	MFG_NC4
205	+5V _{SB}	206	+5V _{SB}
207	MFG_NC0	208	MFG_NC2
209	MFG_NC1	210	MFG_NC3
211	VCC	212	VCC
213	VCC	214	VCC
215	VCC	216	VCC
217	VCC	218	VCC
219	VCC	220	VCC

221	VCC	222	VCC
223	VCC	224	VCC
225	VCC	226	VCC
227	VCC	228	VCC
229	VCC	230	VCC

3.2.2 SECOQseven philosophy's specific signals.

According to SECOQseven philosophy, on μQ7-T30 finger connector there are some signals that are not implemented in Qseven® Specifications rel. 2.0, but that don't interfere with standard Carrier Boards (i.e., Carrier Boards not designed according to SECOQseven philosophy).

DSI Signals

Pin 132/134 DSI Clock Differential Pair
 Pin 138/140: DSI Differential pair 0
 Pin 144/146: DSI Differential pair 1

These pins are not foreseen in Qseven® specifications rel. 2.0. However, in these same specifications these pins are defined as "Reserved differential pairs". Since signals carried on there are differential pairs, they don't cause any incompatibility with Carrier boards not developed for the use with μQ7-T30 module.

3.2.3 Second SDIO interface

According to Qseven® Specifications rel. 2.0, instead of LPC signals, on pins 185÷192 it is possible not to drive LPC bus, but use these pins as General Purpose I/Os.

Since Tegra T30 doesn't offer a native LPC interface, on μQ7-T30 finger connector are available the signals for a second SDI/O interface.

If your carrier board uses LPC interface, please consider that that interface will not work using μQ7-T30 module.

3.2.4 Special consideration about PCI-express interface

On μQ7-T30 golden finger connector are carried four PCI-express lanes.

By programming opportunely them, it is possible to configure these PCI-express lanes to work as a single PCI-e x4 lane, or two PCI-e x2 lanes.

PCI-e x2 lanes can also be used to drive PCI-e x1 devices, but there is a limitation in this, i.e. only two PCI-e x1 devices at a time can be used.

In this case, one device must be placed on PCI-e lane#0 or #1, the other device must be placed on PCI-e lane #2 or #3.

